FIG. 1
(Related Art)

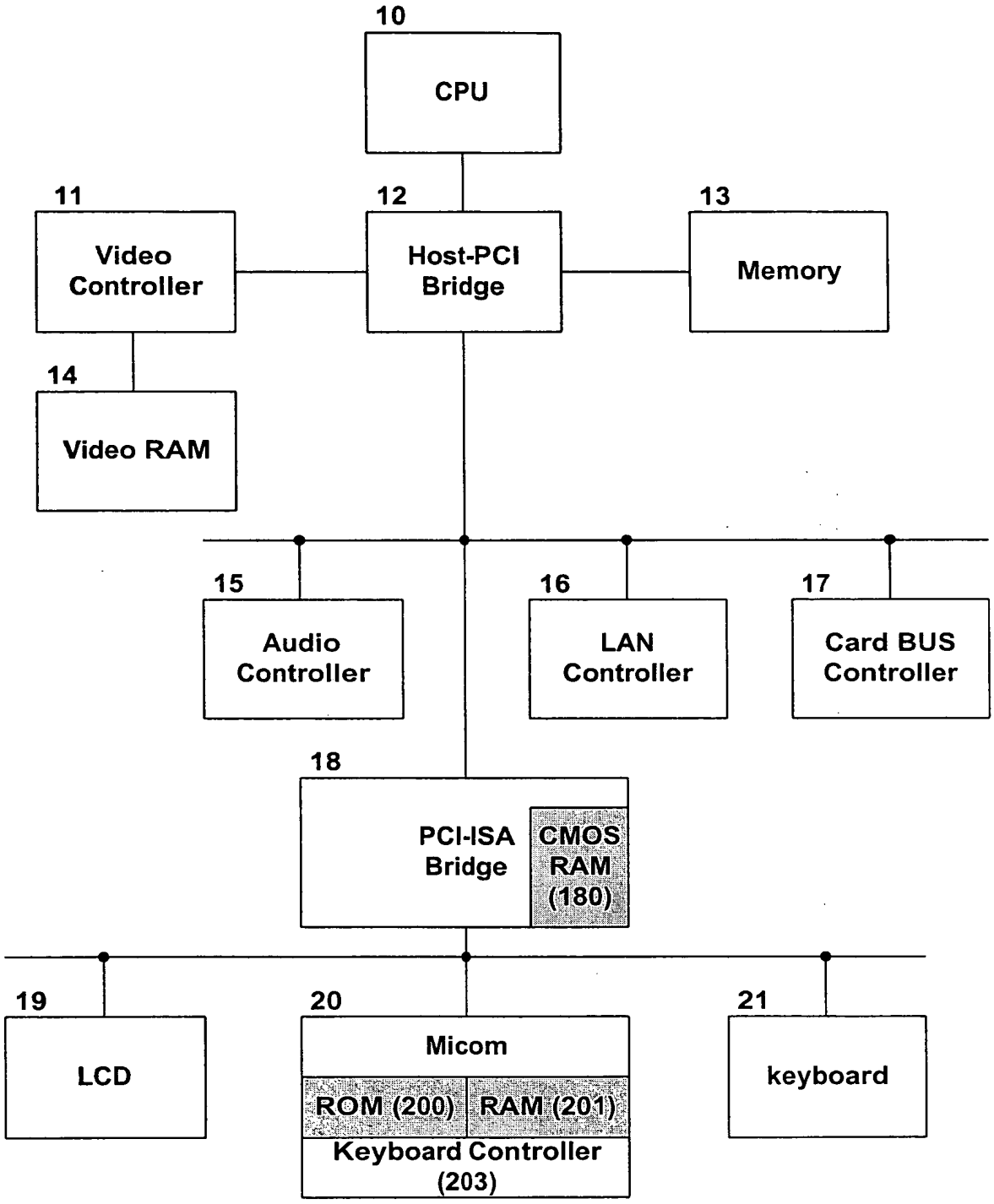

FIG. 2
(Related Art)

Notebook Computer

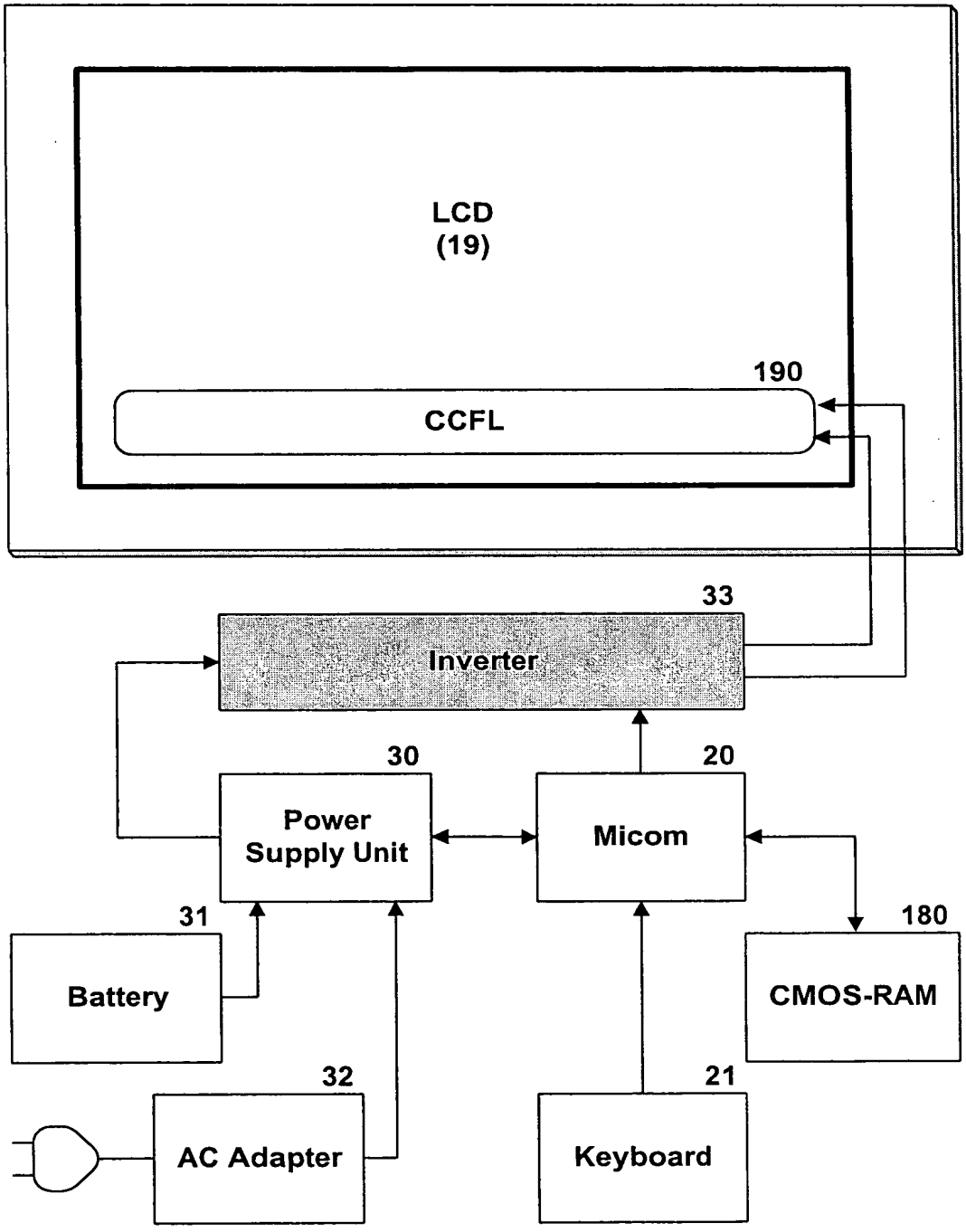

FIG. 3

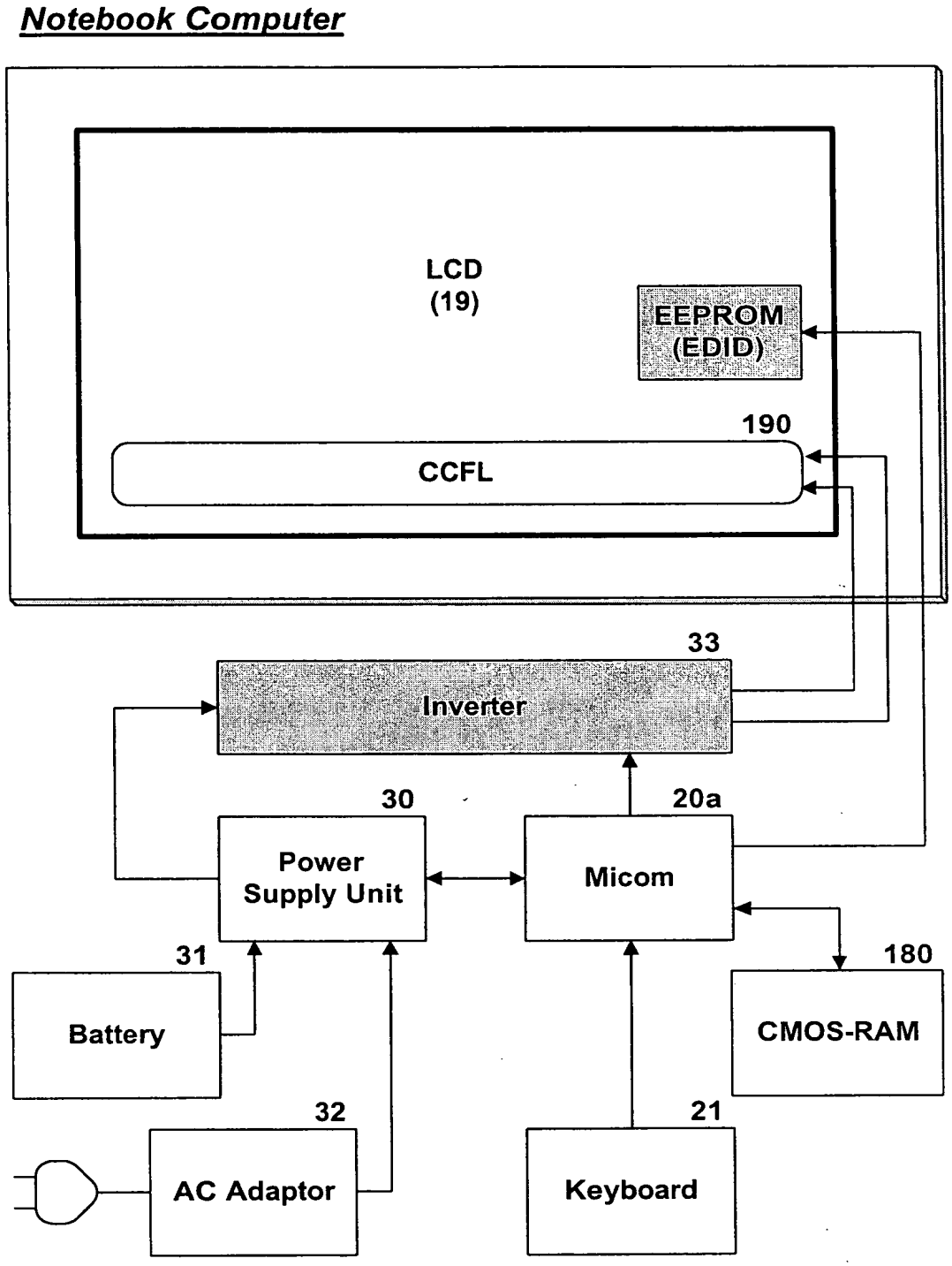
Notebook Computer
LCD
(19)
EEPROM
(EDID)
190
CCFL
33
Inverter
30
Power
Supply Unit
20a
Micom
31
Battery
180
CMOS-RAM
32
AC Adaptor
21
Keyboard

FIG. 4

Extended Display Identification Data (EDID)

Address	No. bytes		Description
00h	1	Bytes	EDID Structure Version / Revision
01h	7	Bytes	Vendor / Product Identification
01h		2	ID Manufacture
⋮	⋮	⋮	⋮
80h	127	Bytes	Luminance Table & Timing Descriptions
*		x*A	Luminance Table
*		8*B	Range Limits
*		27*C	27-Byte - Detailed Range Limits
*		4*D	4-Byte Timing Codes
*		18*E	18-byte Detailed Timing Descriptions
*		X	X=127 - (x*A+8*B+27*C+4*D+18*D)
FFh	1	Byte	Checksum

FIG. 5

Display timing range limits

8	Bytes	Bit	Description
	1	7-0	Min Frame / field rate in Hz
	1	7-0	Max Frame / field rate in Hz
	1	7-0	Min line rate in kHz
	1	7-0	Max line rate in kHz
	1	7-0	Lower bits frame / field & line rate
	1	7-0	Min pixel rate in MHz
	1	7-0	Max pixel rate in MHz
	1	7-4	Upper bits min pixel rate
		3-0	Upper bits min pixel rate

FIG. 6

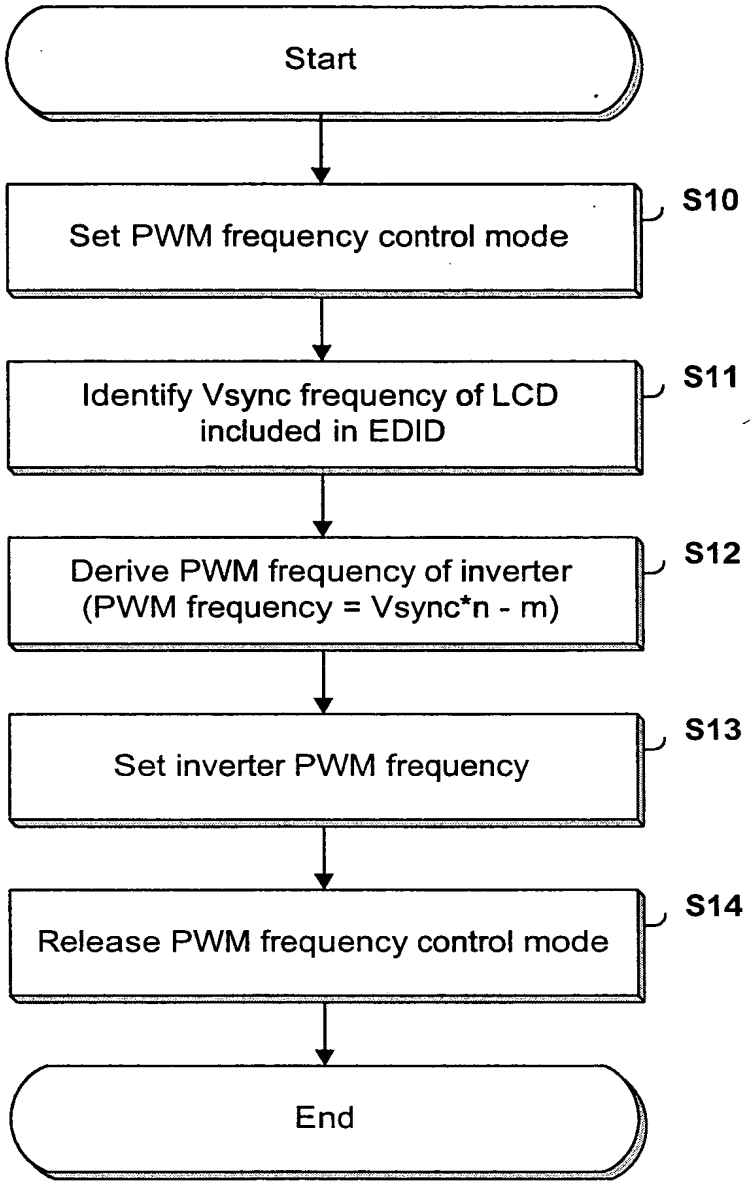
Start
Set PWM frequency control mode
S10
Identify Vsync frequency of LCD included in EDID
S11
Derive PWM frequency of inverter (PWM frequency = Vsync*n - m)
S12
Set inverter PWM frequency
S13
Release PWM frequency control mode
S14
End

FIG. 7

LCD Refresh Rate	Output PWM	LCD Refresh Rate	Output PWM	LCD Refresh Rate	Output PWM
60	270	53	238.5	46	207
59	265.5	52	234	45	202.5
58	261	51	229.5	44	198
57	256.5	50	225	43	193.5
56	252	49	220.5	42	189
55	247.5	48	216	41	184.5
54	243	47	211.5	40	180

FIG. 8

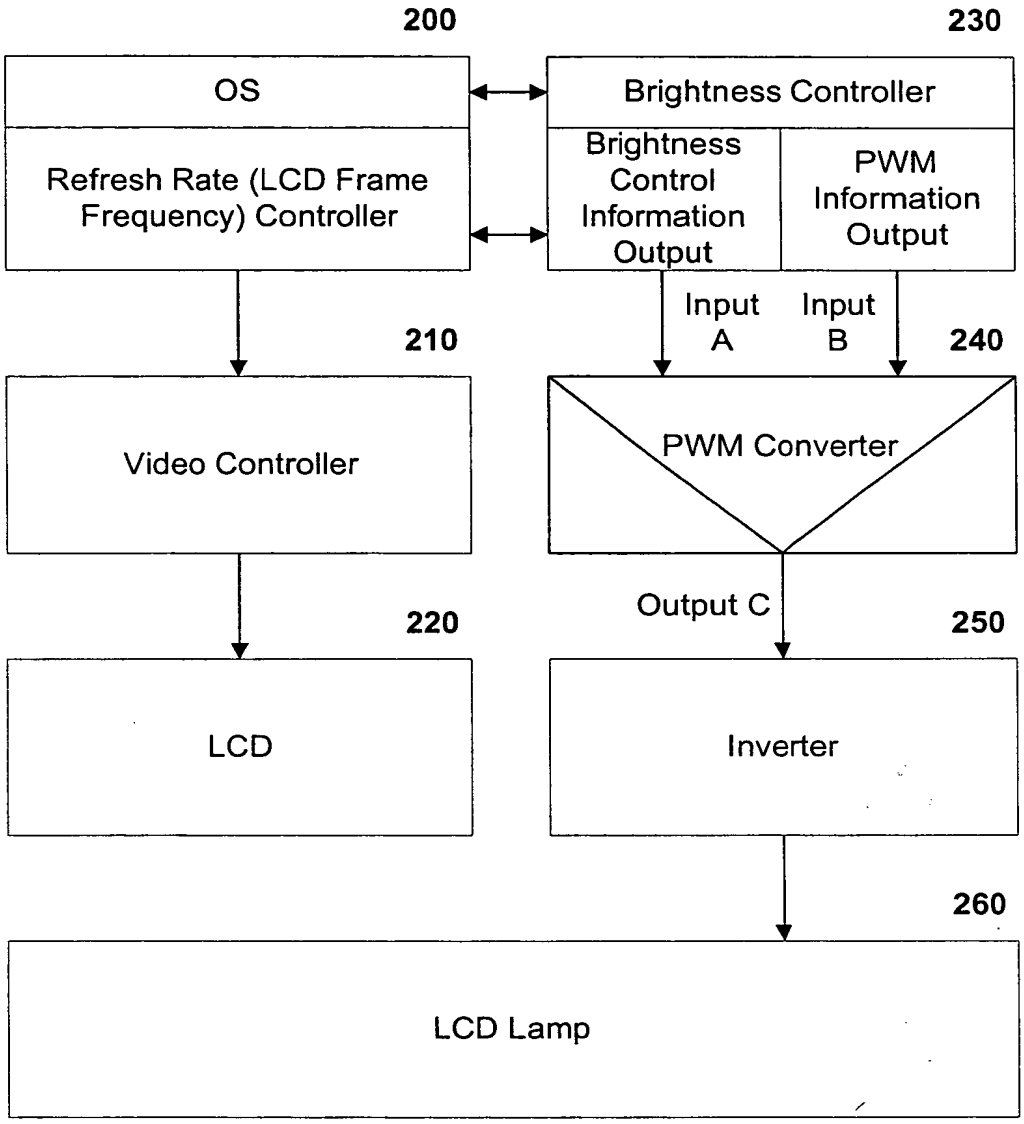
200
230
OS
Brightness Controller
Refresh Rate (LCD Frame Frequency) Controller
Brightness Control Information Output
PWM Information Output
Input A
Input B
210
240
Video Controller
PWM Converter
Output C
220
250
LCD
Inverter
260
LCD Lamp

FIG. 9

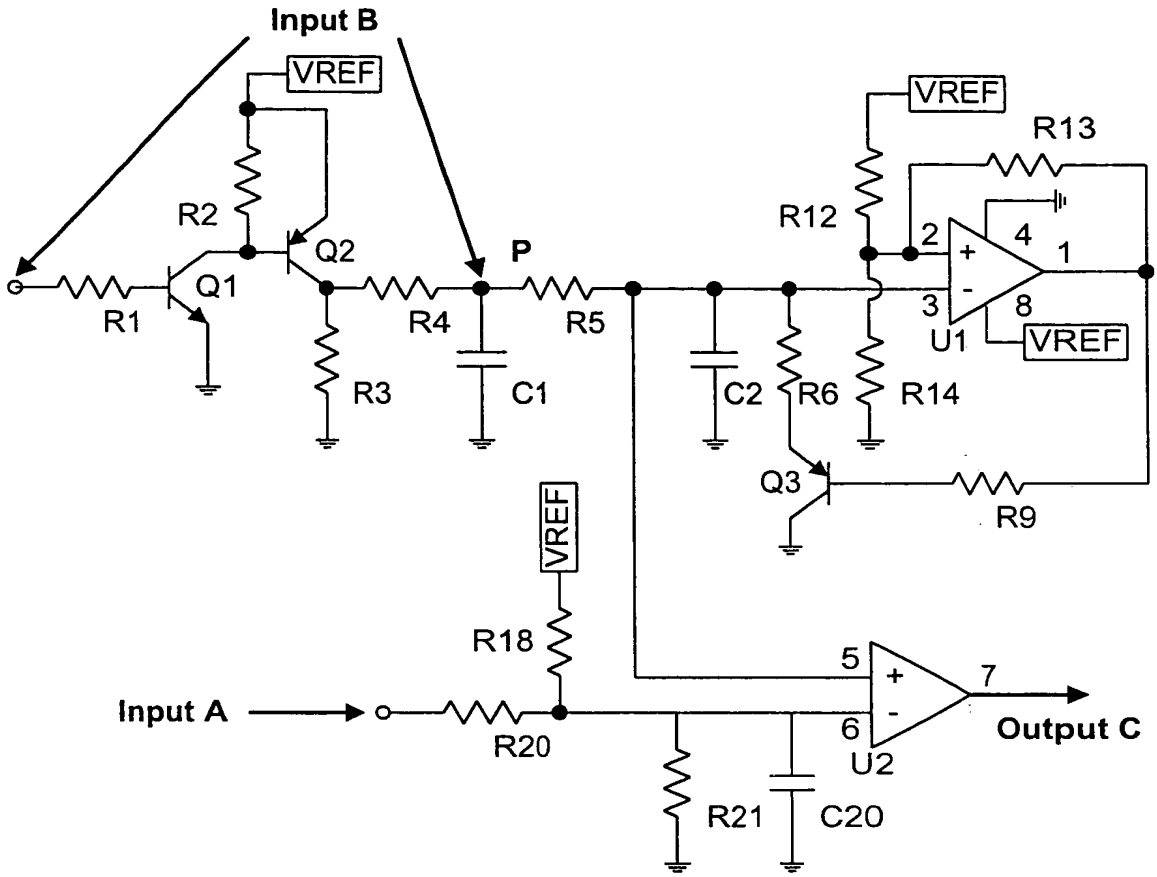
Input B
VREF
R2
Q2
Q1
R1
P
R4
R5
R3
C1
C2
R6
R14
R12
R13
VREF
2
4
1
+
-
3
8
U1
VREF
Q3
R9
VREF
R18
Input A
R20
5
+
7
-
6
U2
Output C
R21
C20

FIG. 10

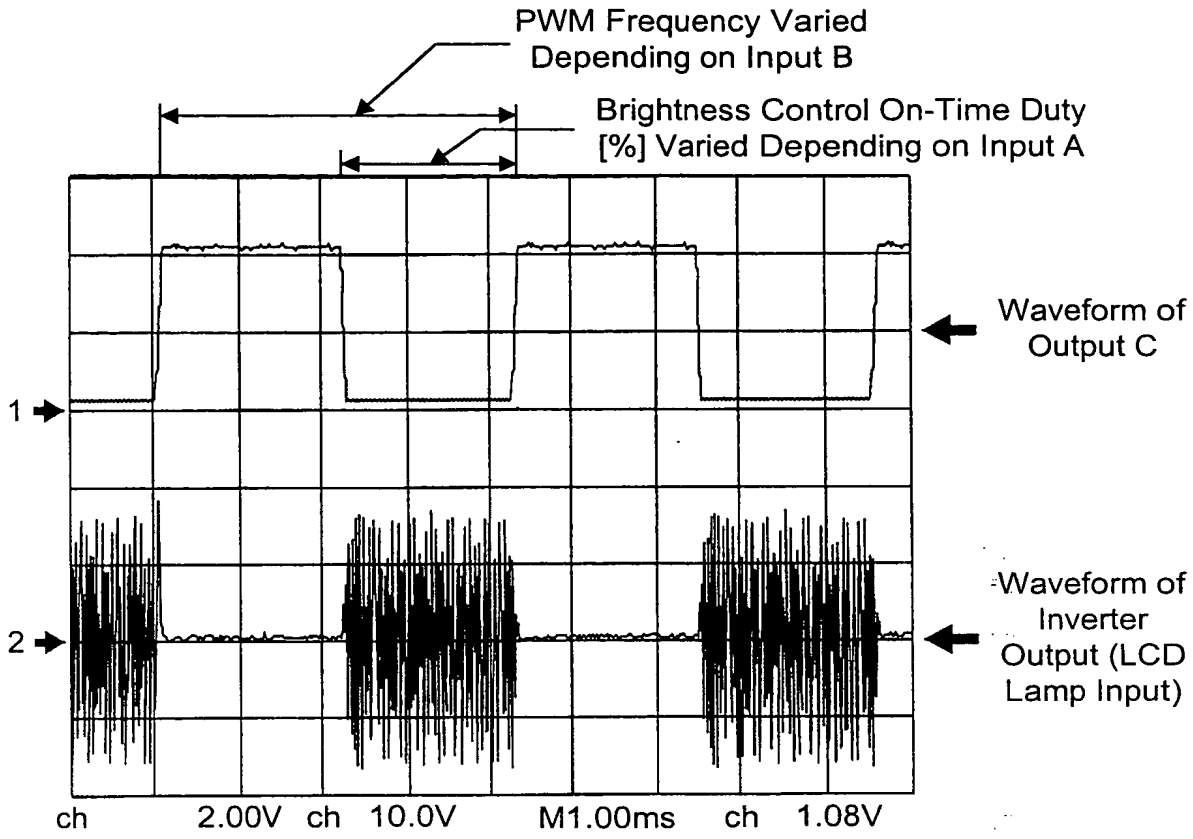
PWM Frequency Varied
Depending on Input B
Brightness Control On-Time Duty
[%] Varied Depending on Input A
Waveform of
Output C
1
2
Waveform of
Inverter
Output (LCD
Lamp Input)
ch 2.00V ch 10.0V M1.00ms ch 1.08V

FIG. 11

LCD Refresh Rate	Optimum PWM	DC Voltage	Output PWM
		3.300	272.0
60	270	3.248	270.5
		3.197	269.0
		3.145	267.5
59	265.5	3.094	265.9
		3.042	264.4
		2.991	262.9
58	261	2.939	261.4
		2.888	259.9
		2.836	258.4
57	256.5	2.784	256.8
		2.733	255.3
		2.681	253.8
56	252	2.630	252.3
		2.578	250.8
		2.527	249.3
55	247.5	2.475	247.8
		2.423	246.2
		2.372	244.7
54	243	2.320	243.2
		2.269	241.7
		2.217	240.2

LCD Refresh Rate	Optimum PWM	DC Voltage	Output PWM
53	238.5	2.166	238.7
		2.114	237.1
		2.063	235.6
52	234	2.011	234.1
		1.959	232.6
		1.908	231.1
51	229.5	1.856	229.6
		1.805	228.0
		1.753	226.5
50	225	1.702	225.0
		1.650	223.5
		1.599	222.0
49	220.5	1.547	220.5
		1.495	219.0
		1.444	217.4
48	216	1.392	215.9
		1.341	214.4
		1.289	212.9
47	211.5	1.238	211.4
		1.186	209.9
		1.134	208.3

LCD Refresh Rate	Optimum PWM	DC Voltage	Output PWM
46	207	1.083	206.8
		1.031	205.3
		0.980	203.8
45	202.5	0.928	202.3
		0.877	200.8
		0.825	199.3
44	198	0.774	197.7
		0.722	196.2
		0.670	194.7
43	193.5	0.619	193.2
		0.567	191.7
		0.516	190.2
42	189	0.464	188.6
		0.413	187.1
		0.361	185.6
41	184.5	0.310	184.1
		0.258	182.6
		0.206	181.1
40	180	0.155	179.5